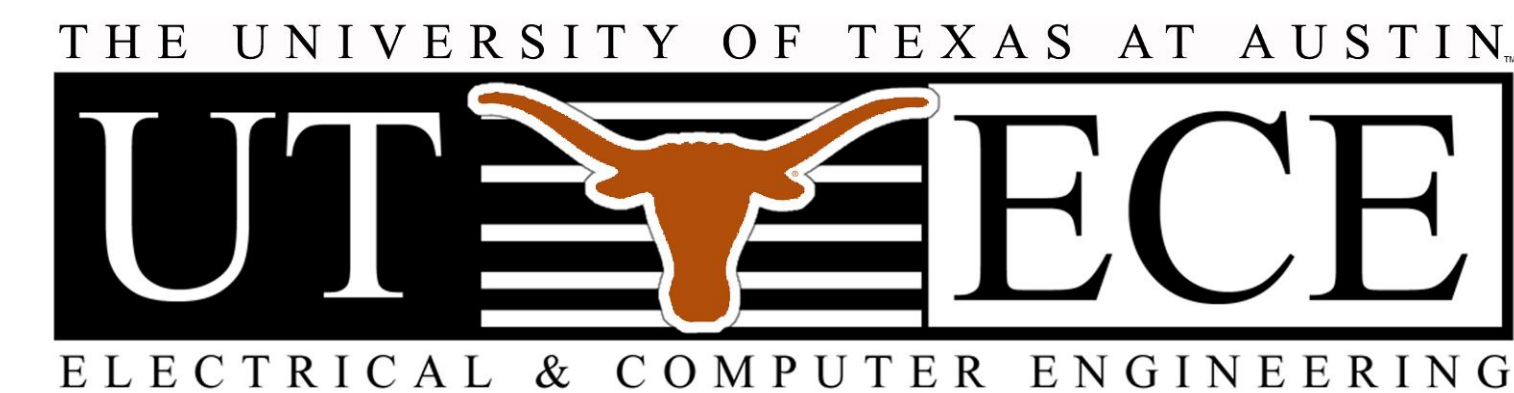


The University of Texas at Austin, Power Electronics Research Group

Natural Disasters Hardened Power Supply through Microgrids

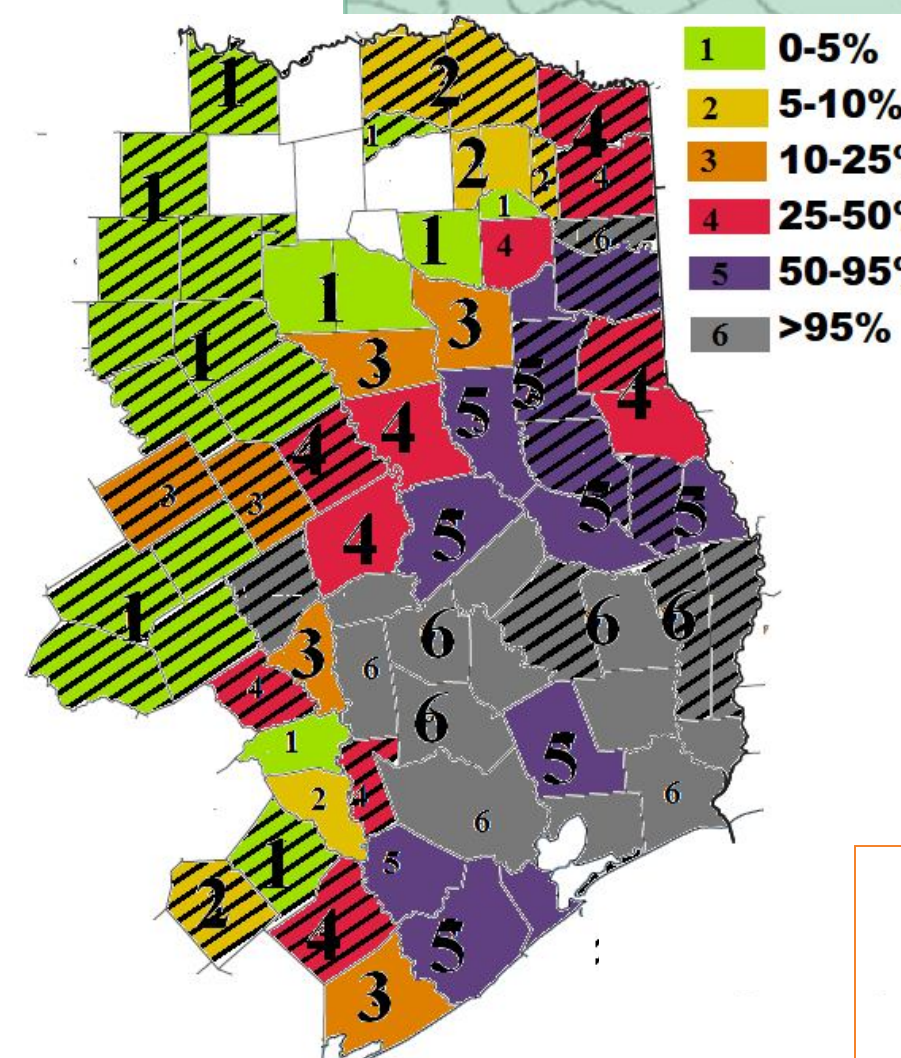
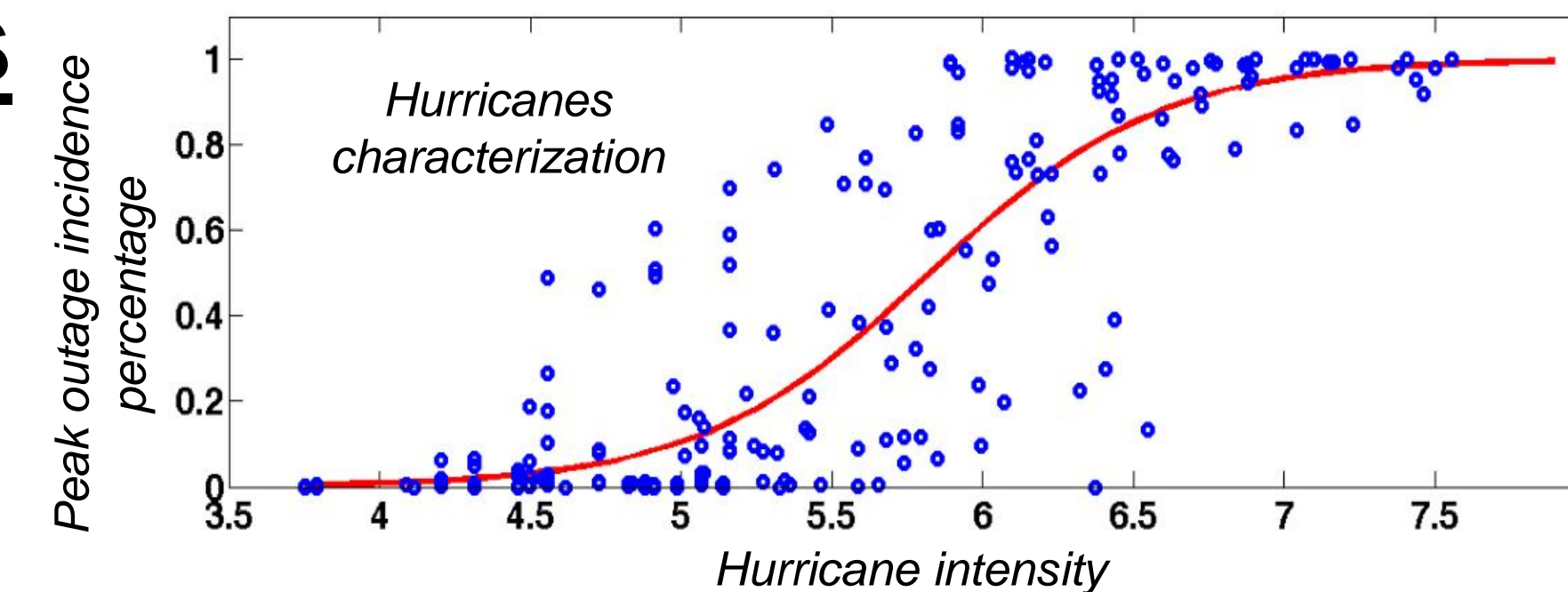
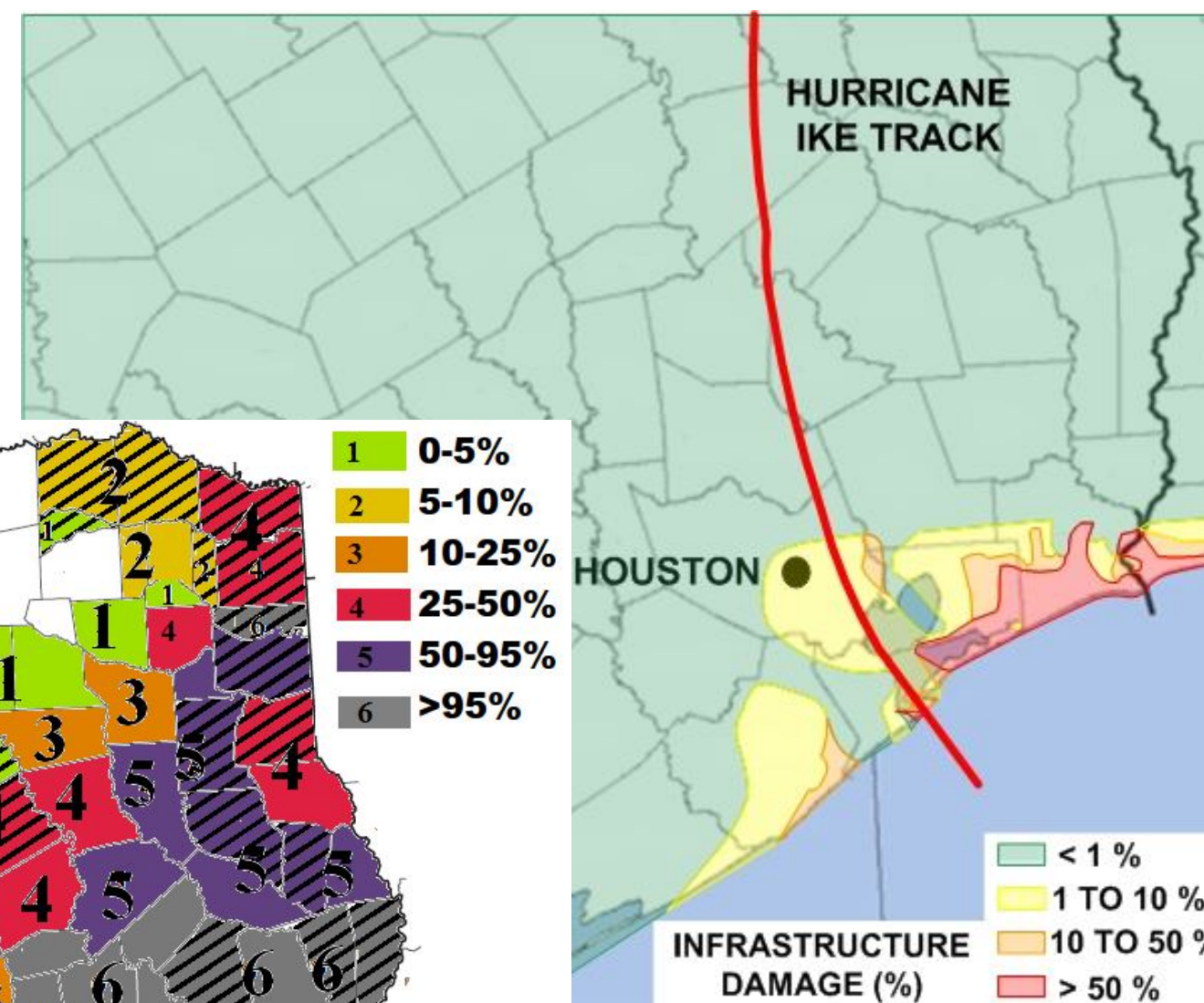
Alexis Kwasinski

Work supported by NSF under CAREER award #0845828 and NEC Labs



Power grids performance during natural disasters

Extreme damage is typically confined to relatively small areas



Conventional power grids are very fragile systems: less than 1 % of damaged components may still cause 100 % of outage incidence



Lifelines performance influences microgrid availability



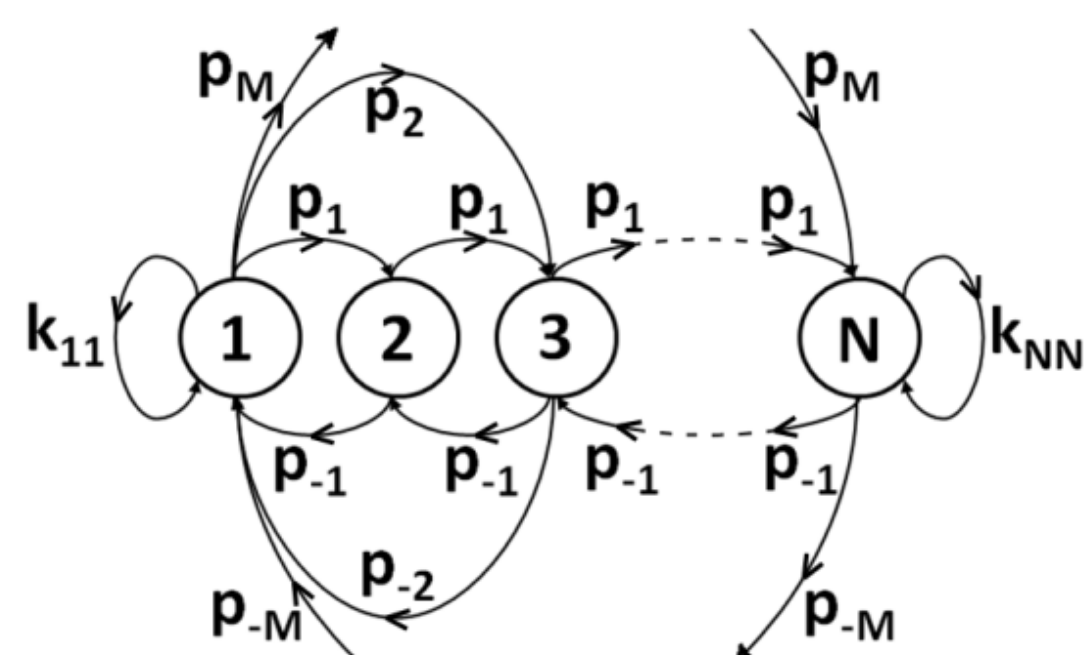
Lifeline dependencies can be decoupled using energy storage



Enhanced power availability through microgrids

$$\text{Microgrid unavailability: } U_{MG,T} \cong \sum_{j=1}^{M_C} \prod_{l=1}^{c_j} u_{l,j} e^{-\mu_{FW} T_{BAT}}$$

Renewable energy sources do not have lifelines but their output is variable and their footprint is large



Markov chain model for PV + battery system



Successful microgrids in disaster areas

Source diversity with multiple-input converters

